EUROPEWAVE

Blue Horizon 250

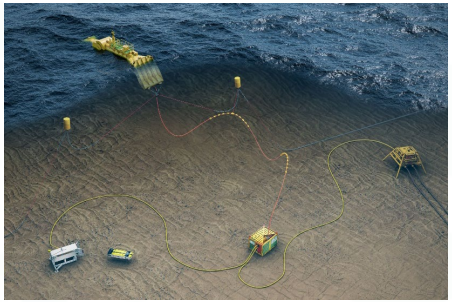
Jon Clarke

Head of Projects

Mocean Energy

This project has received funding from the European Union's Horizon 2020 research and Innovation programme under grant agreement 883751.

Mocean Energy - Context



bluestar

SMALL: 2024

20 kW – Circa 50 Tonnes

O&G; CCS; Power as a Service; replacing subsea umbilicals

Projects of 1-2 devices

blueHORIZON

MID: EUROPEWAVE TIMELINE

250 kW – Circa 400 Tonnes

Islands; remote communities; CCS; aquaculture; early grid

Projects of ~40 devices

blueHORIZON

GRID: 2030

1 MW – Circa 1300 Tonnes

Grid; including wind-wave co-location

Projects of 100+ devices

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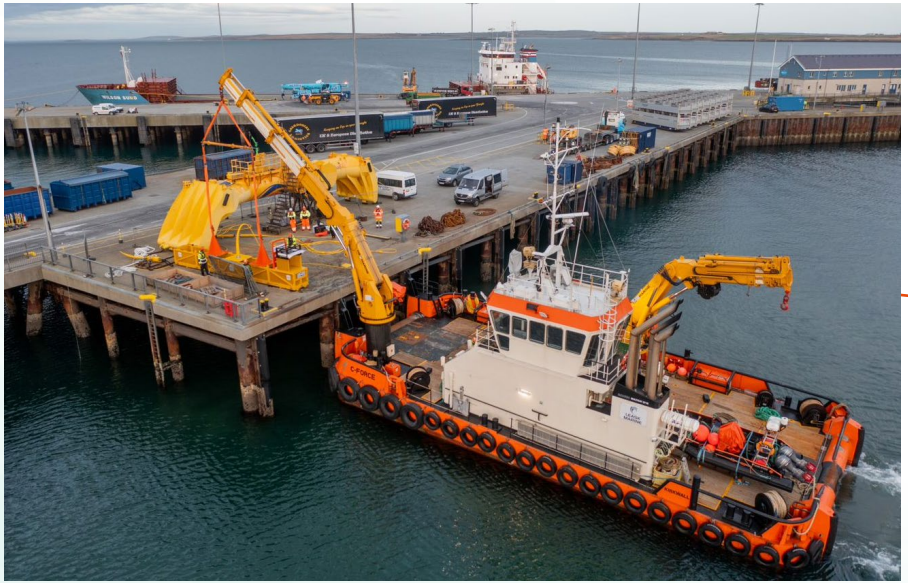
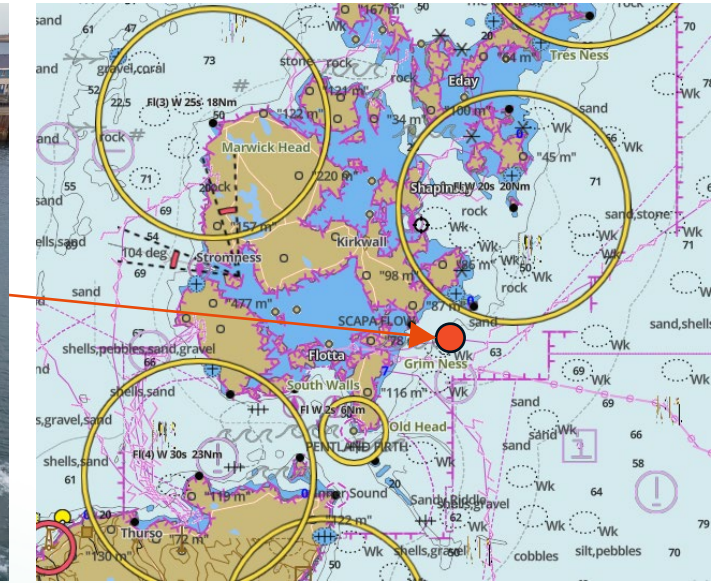
BlueX Deployment

Net Zero Technology Centre
Technology Driving Transition
Harbour Energy
SERICAENERGY
Baker Hughes
verlume
Transmark Subsea





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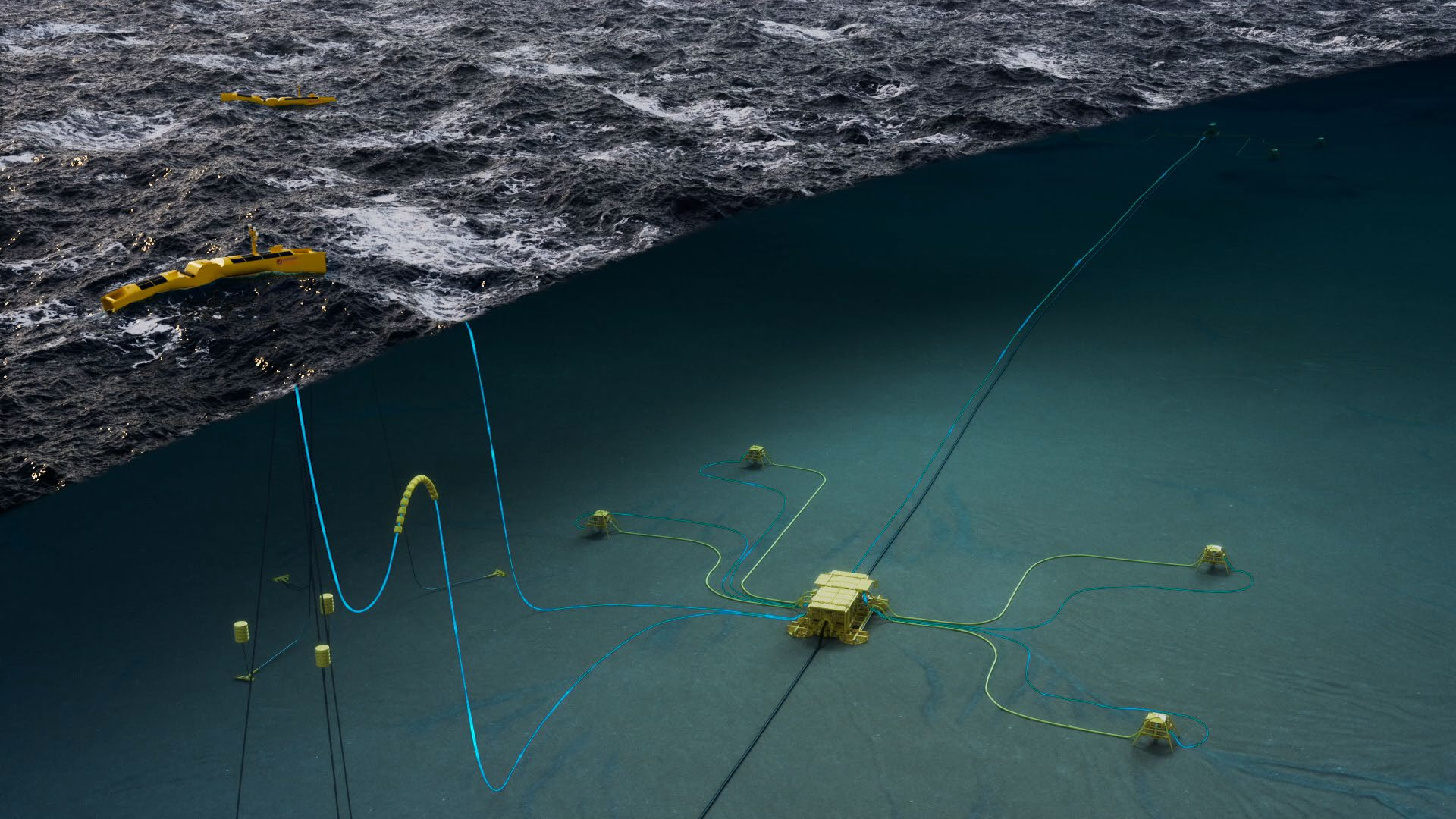

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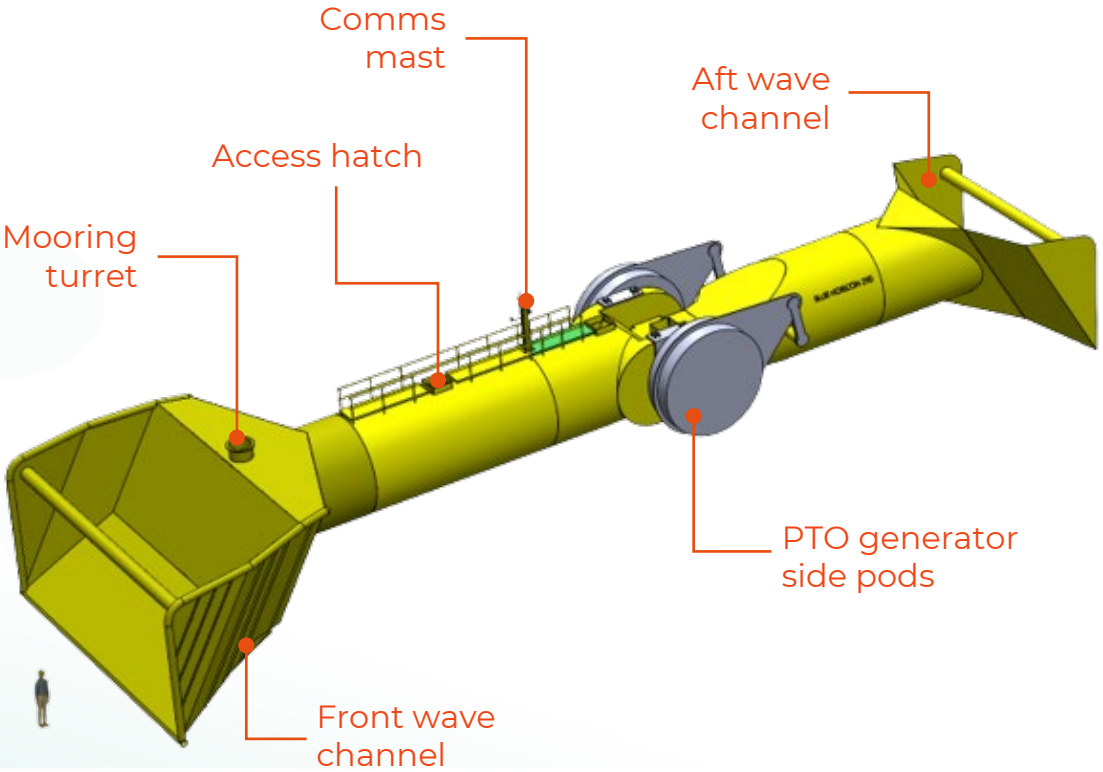
Features

- "Mid" scale
- Hinged raft; asymmetry of hulls increases bandwidth
- Wave channels increase power absorption and enable steep wave diving

Power rating	250 kW
PTO	Direct-drive electrical
Mass	Approx 400 tonnes
Length	48 m



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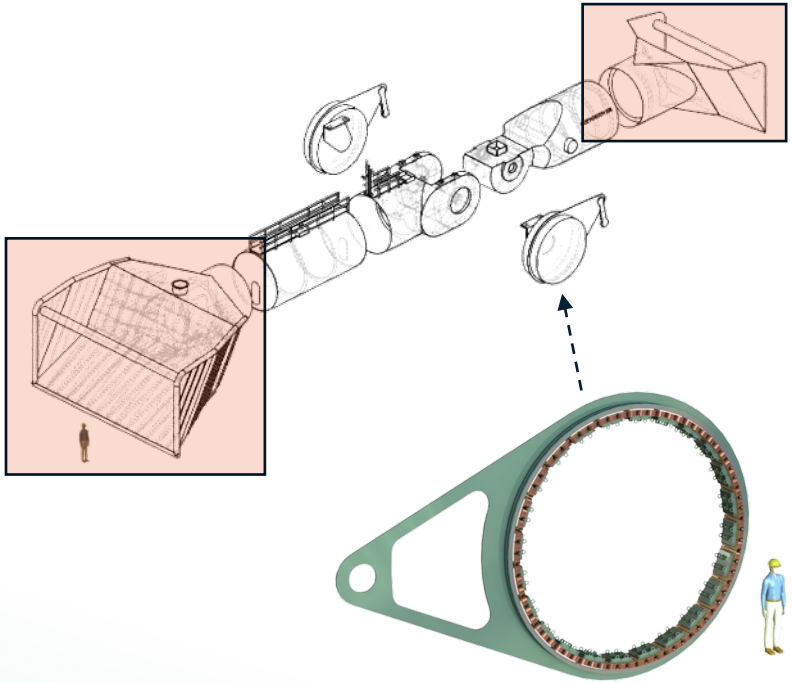
Innovations

- AI-based design to optimise geometry
- Structural optimization & modularity
- Vernier Hybrid Machine generator (PTO) ideal for high-torque, low-speed reciprocating wave excitation
- Larger volumized wave channels
- Quick Connect System



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Target Applications

Current focus on islands & remote coastal communities.

Future markets include O&G, CCS, aquaculture, and early grid projects.

Aim(s) by end of Phase 2:

- Develop 2-3 specific case studies to build value proposition, including cost & operations
- Refine commercialisation strategy & roadmap

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Team

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Phase 1: 6 contractors

Phase 2: 12 contractors

UK FMECA & RAM Analysis	**UK** Structural & Mechanical Design	**UK** Tank Testing	**UK** Generator Design
UK Operations Review	**USA** Hydrodynamic Modelling	**UK** Reinforcement Learning	**UK** Mooring Design & Operations
Ireland Tank Testing TPV	**UK** CCI System Design	**UK** Fabricator	**Portugal** Engineering TPV

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Some Key Achievements So Far

- MoU signed with Scottish fabricator to build Blue Horizon
- Scaled PTO test rig being built; testing starts April 2023
- Letter of Support from MERIC (Chile) for post EuropeWave development
- Mooring design matured; QCS options shortlisted

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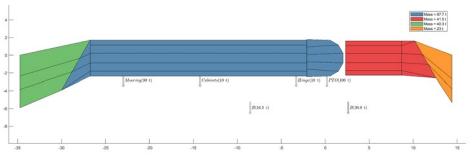
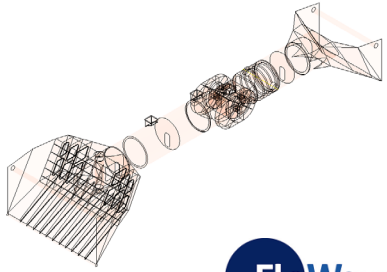
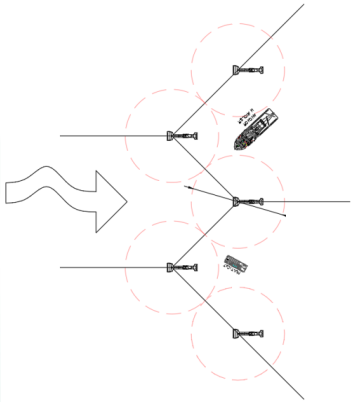
Some Key Achievements So Far

- Programmatic geometry frozen
- Structural-mechancial design maturing with focus on CAPEX
- Tank test (round 1) undertaken; numerical model validated
- WEC array concept developed
- 24 commercial meetings undertaken: scoping opportunities & supporting case studies







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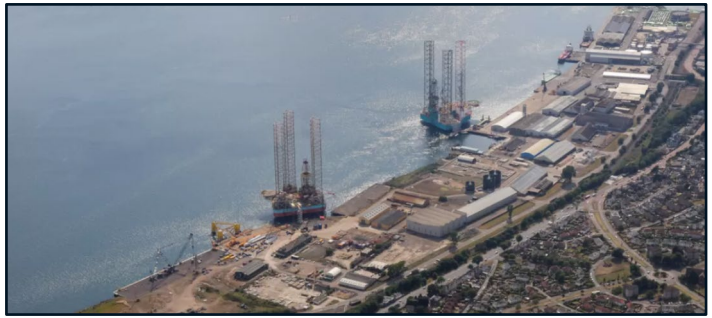
Some Key Learnings So Far

- **Manufacture:** Limited number of local manufacturers with capability, capacity & portside facilities
- **LCOE:** Make cost reduction core to design using target-driven, sub-system-oriented approach
- **Testing:** Most effective method to validate extremes is by testing at scale; BlueX provided valuable input



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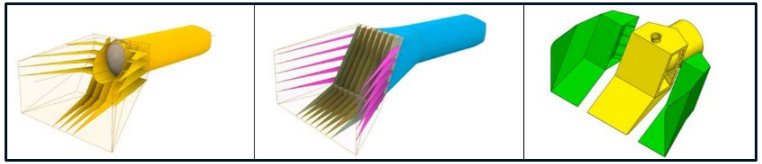
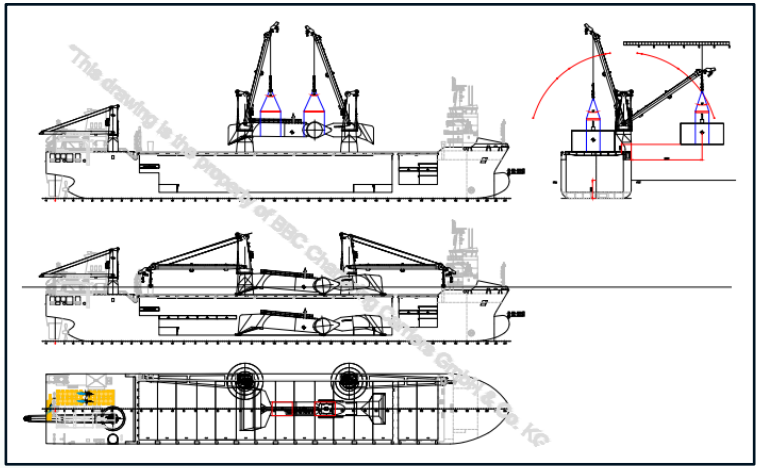
Some Key Learnings So Far

- **Structure:** Use of composites explored; not suitable for our application but holds potential for other WEC designs
- **QCS:** Solutions not yet “oven-ready” for our application – however some solutions can be adapted
- **Operations:** WEC transport & offloading are major cost & operational considerations for remote locations
- **Timeline:** Don’t underestimate time required for Detailed Design





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PHASE 3: Ambitions

- Build & deploy full-scale WEC – product scale rather than prototype scale
- Achieve Stage 4 of IEA development: commercial-scale single device demonstration (TRL 7)
- Demonstrate power performance and O&M over a period of 12 months at sea
- Establish commercialisation strategy
- Meet IEA-OES metrics – exceed cost of energy targets identified via case studies

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Looking Ahead

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